Vol. 104 No. 2 FEBRUARY 9, 1946

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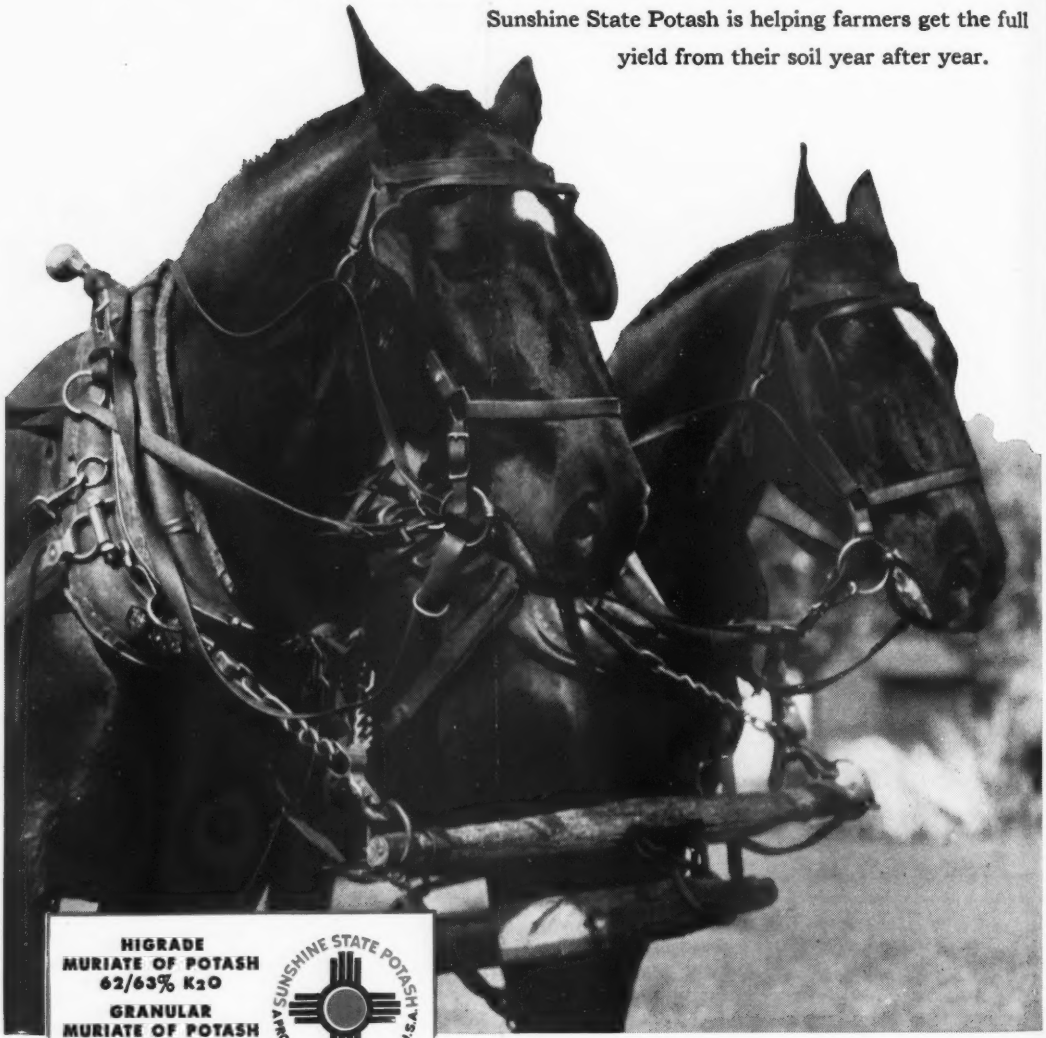

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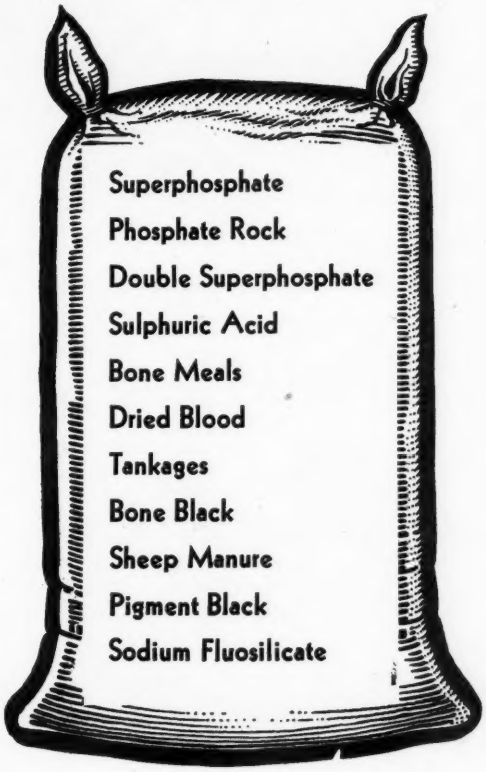

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AMERICAN FERTILIZER

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Vol. 104 FEBRUARY 9, 1946 No. 3

LIGNIN: Fertilizer Material or Soil Amendment

A Brief Review of Selected Investigations

By VINCENT SAUCHELLI, F. A. I. C.,

The Davison Chemical Corporation

"We have never been a nation of faggot-pickers. The conviction that our natural resources were inexhaustible has shaped our economy. . . . Today the signs are many that America's traditional plenty, while by no means worn out, is fraying about the edges. Unparalleled calls for war have gouged our mines, oil wells, and forests. Industry thinks of going in for faggot-picking, after all. But it will be faggot-picking on the typically American grand scale. Thanks to advanced technology, the mounds of rubbish cast off by industry can become profitable raw materials.

"An outstanding example is the wealth latent in sawing refuse, long the No. 1 disposal problem in lumbering. Through the magic of chemistry, the nation's sawdust heaps can sustain new industries, with products ranging from ethyl alcohol, motor fuels, and cattle feeds to plastics, dyes, drugs and flavors."

—"Newsweek" February 12, 1945.

WITH the above quotation as an introduction to the general subject of the utilization of lignin in agriculture, it may be proper to ask ourselves some questions.

What is lignin? What is the possibility of making use of some portion of the nation's vast, untapped mound of wood waste as a source of materials to enrich depleted soils or, perhaps, to restore the structure of worn-out, wounded and sick soils? This enormous waste pile has since 1838 attracted scores of clever investigations. Many skilled attempts have been made to work out practical economical solutions. Some of the early claims of success were merely newspaper headline flashes. A few recent results look promising. The purpose of this review is to tell about some of the recent investigations which have a direct bearing on soil building practices.

It is estimated that the annual production of sawmill waste amounts to 30 million tons, which by hydrolysis could furnish about seven million tons of lignin. One ton of dry scrap wood processed by hydrolysis yields 500 pounds of lignin waste. Sulphite pulp mills dump about 1,750,000 tons of lignin every year. In New England alone, the total annual amount of unsaleable wood waste is about 7,000,000 tons. If there is any Alexander among the chemical profession crying because there are no new worlds to conquer, we respectfully draw his attention to this challenging mountain of precious wood waste.

I asked several forest products chemists to give me a definition of lignin. I was told a clear-cut definition probably could not be given because of differences due to the condition in which the lignin happens to be.

Lignin is a name applied to several types of compounds and not to a single, isolated, chemical entity. Although we know it comprises the same elements as petroleum and coal, we do not yet have a complete structural analysis of isolated lignin. Chemists hope that they will some day discover the secret of how the hydrocarbon molecules are linked together. With the secret found, it is expected that from lignin a new industry of many coal-tar products will follow, including the manufacture of aspirin, perfumes, drugs, resins, sulfa drugs and many bulk chemicals and fertilizers.

To make this review reasonably intelligible to the layman, as well as to the professional

man not too familiar with forest products, some definition is desirable. The following quotation from a recent article by J. Seiberlich of the University of New Hampshire, will be helpful (*1*).* "Generally two types of lignin have to be considered when discussing lignin products for possible use as fertilizer. The first are the lignins as they are present in a living tree in the form of lignocellulose. Their true structure in this form is still unknown. These types of lignins are called 'protolignins' or 'unaltered lignins.' Whatever the nature of these substances, it is now becoming clearly recognized that they represent products extremely sensitive to the action of chemical reagents such as alkali or acids, by which they are readily converted into dark amorphous polymer condensation products.

"The second and much more common type of lignins are those which are eliminated from plants and trees by chemical or biological action. Lignin is attached to cellulose to form lignocellulose. The chemical bonds must be strong, since it requires drastic chemical action to free this compound from its combinations. All isolated lignins are condensed to larger complexes. This is no handicap so far as the chemical investigation is concerned. A cellulose chain of 20 units is not much different chemically from a cellulose chain of 40 units. It might, however, make a difference so far as the biological action is concerned."

Since we shall be concerned chiefly with the behavior of lignin in soils, let us see what the same authority (*1*) has to say about this:

"If lignin is exposed to the air, oxidation takes place . . . forming such acids as formic, acetic, oxalic malonic, succinic and others. . . . Lignin in the soil is a most resistant material against the action of fungi, bacteria, or invertebrate animals living in soil, peat bogs, etc. Lignin in fresh plant tissues may be partly decomposed by higher fungi, but once the lignin becomes isolated it resists attack even by these organisms. The chemical nature of lignin in the plant varies with its growth (increase of methoxyl content). Lignin in younger plants seems to be more easily attacked by microorganisms than in older plants. Due to its high resistance to attack of microorganisms, lignin becomes more and more concentrated in the soil, while its accessories, cellulose, pectin, etc., are quickly removed. This process is the so-called humus formation, the most important source of humus in nature. With the gradual transformation of lignin in soil humus, its absorption degree increases, it combines with proteins and shows greater solubility in alkali. These alkali soluble fractions of former lignin, the so-called humic acids, differ from original lignin by a lower methoxyl content, darker in color and presence of nitrogen."

At present the two important sources of lignins from waste material are residues from hydrolyzed sawmill products and the waste liquor from sulphite pulp mills. The largest amount of research has been done with the waste liquors from the sulphite process. The research men who so far have volunteered an opinion are inclined to believe that there is a great difference between the lignins from each of these major sources and that the lignin hydrolyzed from forest products in the manufacture of sugar is better for building up humus. Sulphite waste lignin, therefore, may prove to be inferior as a source of humus. In this connection it is interesting to note that this year the first commercial alcohol-from-wood plant in America is being built at Springfield, Oregon (*2*). It uses the so-called Scholler-Tornesch process which had proved so successful in Germany as the basis of that country's war economy. This plant will produce ethyl alcohol, lignin, and other derivatives through the acid hydrolyzation of sawdust. Two hundred tons of sawdust will be consumed daily to yield 12,000 gallons of ethyl alcohol and 50 tons of lignin. Farmers in the Northwest may have from this source a good supply of humus-forming material.

Recent Investigations on Lignin in Agriculture

In the middle 30's the United States Department of Agriculture investigated the ammoniation of peat to determine its fertilizer possibilities. It was found that the peat fixed about six per cent nitrogen; but, further research revealed that the nitrogen was converted into forms which were not readily available to plants. The ligneous portion of the peat was the reactive component which fixed the nitrogen.

Later investigations extended to the ammoniation of waste sulphite liquor (*3*). The first results looked promising. As in the case of peat, the difficulties encountered made both processes uneconomical. Commercial possibilities were considered remote.

The New Jersey Agricultural Experiment

*Numerals refer to literature citations found at the end of this article.

Station has at present under investigation an extensive series of tests to determine what are the relative values of different organic residues in the soil on crop yields. Dr. Firman E. Bear, Chairman of the Soils Department, kindly furnished us for publication the preliminary report (Table I) which gives the first 4-year results of these tests.

"In cooperation with the Northeast Wood Utilization Council, a project was set up to determine the agricultural value of two wood waste products. Lignin, a by-product from the paper pulp industry, and L. E. F., a partially hydrolyzed sawdust, were applied to a soil in pots at the rate of 2½, 5 and 10 tons per acre. These products were mixed with the upper six inches and small seeded lima beans were planted.

"After the first rain, soil in pots containing lignin had an extremely hard crust. To a certain extent, this crust interfered with the germination of the beans. After several more rains (about four weeks after treatment), this initial crust disappeared and the soil was left in very fine tilth. Water penetrated much more quickly in soil receiving lignin than in controls or those treated with L. E. F. In fact, no water remained on surface of lignin-treated soil for any length of time, despite a rather continuous rainy spell during the growing season. Today, almost five months after adding lignin to the soil, marked favorable differences are still noticeable.

TABLE I

EFFECT OF VARIOUS ORGANIC MATERIALS ON CROP YIELDS AND SOIL ORGANIC MATTER

FOUR-YEAR TOTAL YIELDS AND SOIL ORGANIC MATTER AFTER FOUR YEARS

Rye and Organic Materials	WEIGHT SNAPBEANS		WEIGHT CARROTS		SOIL ORGANIC MATTER	
	Collington Sandy Loam *Grams*	Sassafras Loam *Grams*	Collington Sandy Loam *Grams*	Sassafras Loam *Grams*	Collington Sandy Loam *Per cent*	Sassafras Loam *Per cent*
Lignin	7192	8078	6254	12,337	1.90	3.10
Wheat Straw	7177	8333	7784	13,181	1.36	2.54
Corn Stalks	7361	8861	7465	13,820	1.31	2.26
Peat Moss	7885	8511	7285	12,052	1.49	2.44
Refuse and Rye	7524	7637	7221	9,981	1.22	2.21
Refuse, No Rye	6957	7445	5506	10,479	1.13	2.16
No Refuse, No Rye	6759	7050	3885	9,751	1.13	2.16

Soils Department, New Jersey Agricultural Experimental Station Preliminary Report

NOTES:

1. Soil hauled in from field and placed in cylinders, placing 8 inches B-horizon material in bottom and 8 inches A-horizon material on top.
2. Cylinders are of metal with no bottoms. They surround a surface area of 3.1 square feet each, or 12.4 square feet for 4 cylinders.
3. Organic materials are applied at rate of 2½ tons dry matter each spring on top of rye cover before spading under. Rye is omitted in last 2 cases. Word "Refuse" indicates top and root refuse of snapbeans and tops of carrots.
4. Snapbeans and carrots follow each other each season. Snapbeans receive fertilizer supplying 100 pounds each of N, P_2O_5 and K_2O, and carrots receive additional fertilizer supplying 25 pounds N and 50 pounds each of P_2O_5 and K_2O.
5. Yields, in grams of merchantable produce, per 4 cylinders To estimate pounds per acre multiply grams by 7.74.

Another interesting lignin investigation in New Jersey has been started by Dr. Benjamin Wolf at the Seabrook Farms, Bridgeton. In these tests a calcium ligno-sulphonate mixture is one of the sources of lignin. A major difficulty experienced on many of the sandy soils of the Atlantic seaboard is their low capacity for holding calcium. The calcium ligno-sulphonate material appealed to Dr. Wolf for this reason. The other lignin material under test is what is called a "lignin-enriched-filler" (L. E. F. for short), which is hydrolyzed ligno-cellulose, a refined material generally prepared for the plastics industry.

Dr. Wolf has furnished us for publication the following summary of his first year's comparative results. The lignin products improved markedly the structure of the soil and substantial increases in the yield of lima beans resulted where used.

(Continued on page 28)

Ammonium Nitrate on Vicland Oats

By E. F. DIETZ

Rust-resistant oats, such as Vicland, can be made a crop of major importance on farms where oats are ordinarily considered a poor yielding nurse crop, planted mainly to establish a stand of legumes. Yields of 80 to 100 bushels per acre on heavy soils, and 50 to 70 bushels per acre on lighter soils may be definitely assured by the use of abundant nitrogen fertilizer.

Of course, the soil must contain enough of phosphate and potash and other elements to produce these larger crops, and there must be enough rainfall.

I first tried nitrogen on Vicland oats in 1934, applying a pound of ammonium sulphate to the square rod on 4 square rods in a 20 acre field growing on Miami silt and clay loam soil, near Madison, Wisconsin.

This small plot showed such an improvement over the adjacent part of the field that I decided to give the whole field a dressing of ammonium nitrate in 1944. Applications were made at the rates of 110, 130, and 150 pound per acre, dividing the field into three long sections. I used 2,500 pound on the whole field, or an average of 125 pound per acre.

The results were most gratifying, the field showing a remarkable vigor and improvement over the previous season. The best oats grew in the section receiving 150 pound per acre.

In 1945, I again applied 125 pound ammonium nitrate to the whole field. Although the strip receiving the 150 pound per acre the year before gave the largest yield, I thought that there might be a carry-over of nitrogen from the year before and I did not want to get on too much nitrate and cause early lodging of the oats. I am now satisfied that with this field 150 pound per acre annually is safe, since there appears to be little or no carry-over.

This field has received no barnyard manure for the last 15 years. The soil was generally low in phosphate and potash. Previous to the oats the field had been in hay, corn, soybeans, and corn.

Table 1 gives the data relative to yearly yields of Vicland oats, and the fertilizers used.

TABLE 1

YEAR	LB. PER ACRE	LB. PER CRE	YIELD BU.
1942	200	0–20–20	56
1943	175	0–20–20	60*
1944	200	0–12–12 125 Am Nit. Av.	72**
1945	200	0–12–12 125 Am. Nit.	80***

*A seeding of alsike clover, along with the oats straw, was plowed under in the fall of 1942. This added some nitrogen in 1943.

**Growing season very short. Oats planted May 1st.

***These yield figures are actual weights of oats combined. The last two figures should be increased by about 10%, because of storms flattening the field after ripening.

The above is the story of one particular field. I have had experience with a number of other oat fields where ammonium nitrate has been used. For instance, a field at Spring Green, Wisconsin, on Plainfield sand, on the farm of Leon Peck, gave the following results:

FERTILIZER LB. PER ACRE	YIELD BU.	STRAW LB
80 of 0–30–30 plus 150 of Am. Nit.....	69.1	2037
280 of 0–30–30 only.....	18.6	459*

*Data from check plot cutting by C. J. Chapman, Soils Department, U. of Wis., Madison.

From my experience with ammonium nitrate on Vicland oats to date, I can offer these generalizations:

1. On heavy soil, or on sandy soil rich in humus, the ammonium nitrate may be applied shortly before planting with good results. Very little leaching will occur.
2. On heavy soil, or sandy soil rich in humus, the nitrate may be applied shortly after planting with just as good results.
3. On light sandy soils low in humus, the ammonium nitrate should be applied a week to ten days after planting, and, if the soil is a very leachy one, the nitrate should be put on in two applications about fifteen days apart.

   Leachy, sandy soils require considerable more nitrate per acre per bushel increase in yield than do non-leachy soils. Application may be made up to 300 pound per acre.
4. If nitrate is applied to a plowed field before planting, use a field cultivator to work up the land; a disk ridges the soil along with the fertilizer, and the ridges may be seen in the uneven field of growing oats during the entire season.

Rapid Soil Tests Furnish One of the Implements for Increasing Crop Yields

By BENJAMIN WOLF

Seabrook Farms Company, Bridgeton, N. J.

(Continued from issue of January 26, 1946)

A Measure for Organic Matter and Lime

One of the most striking demonstrations of the value of rapid soil tests has been the way they provide a measure of the importance of proper levels of organic matter and lime for the vegetable crops grown. Our studies would indicate that the proper levels of these factors are prerequisites in successful vegetable crop production. On Seabrook Farms, the use of rather large amounts of mixed fertilizer has usually supplied the major fertilizer nutrients in quantity. On these fields, the lack of sufficient organic matter or lime or both has been responsible for the majority of crop failures not due to weather conditions. In fact many fields having crop failures in seasons of adverse weather were found to be poor in the above factors, indicating that some of the ill effects of weather can be reduced by proper soil conditions. The influence of sufficient organic matter coupled with satisfactory lime applications is strikingly demonstrated in Fig. 1.

These results have placed emphasis on the use of sufficient lime and organic matter for best crop results. As a result, we have paid more attention to the lime* content of the soil before planting our crops, making sure that the levels are adequate for the particular crop grown. Also we have attempted to add more organic matter to the soil by means of longer cover-cropping periods and the use of chicken and steer manures.

The need for organic matter and difficulty of improving the level of this factor in the soil have prompted research in this direction. This research has already suggested a farming practice which has the potentialities of revolutionizing our system of fertilization. We are now trying in an experimental way to increase the amounts of organic matter produced by the cover crop by applying fertilizer directly to the cover crop in the fall or late winter. Studies have shown that such fertilization in come cases may as much as double the yields of dry matter produced by nonleguminous cover crops. Such additions of cover crops may also have the added advantage of supplying fertilizers in organic combinations to the succeeding crop. Practical horticulturists have often desired some nitrogen in organic forms, but costs of organic nitrogen have been prohibitive. Fertilization of cover crops with inorganic nitrogen seems to be a cheap way of converting this nitrogen to organic forms. Using this system on cover crops plowed under for peas appears to be

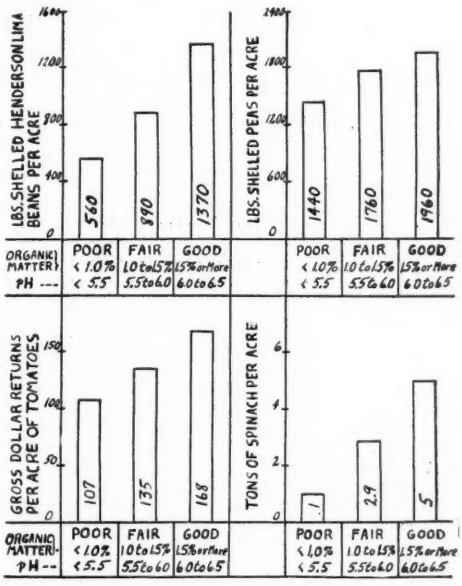

Fig. 1. The influence of soil pH and organic matter content upon the returns of four vegetable crops grown under South Jersey conditions

*As will be pointed out later, we consider the calcium and magnesium contents as well as the pH as indicators of satisfactory liming.

entirely satisfactory. We have no evidence as yet that it would work as well for other crops where the cover crop is left for a longer period in the spring.

Levels Consistent with Good Yields

In the investigations of crop failures and successes, definite measures of various factors that are important in vegetable production at Seabrook Farms have been established. With this information we can now provide the essentials for successful vegetable growing by modifying our application of lime, fertilizer, and cover-crop practices to meet our standards established by these minimum measures of soil fertility. These standards were established by correlating the vegetable yields with the amounts of plant food found present though the soil analyses. The levels for several crops grown under South Jersey conditions are given in Table I.

The importance of these levels can readily be illustrated by two facts. The first concerns the growing of peas. The pea crop, of all the crops grown here with the possible exception of spinach, is the most exacting in its requirements for organic matter, pH, calcium, magnesium, nitrogen, phosphorus, potassium, and trace elements. These we now provide before the crop is planted. Without rapid soil tests, this could not be done satisfactorily. The results of the application of this system are shown by the yield of peas at Seabrook Farms in the past five years as compared to other states in the pea-growing areas (Table II). Through the established crop practices, Seabrook Farms has developed a new pea industry. To do this, a farm practice had to be established to meet the requirements of growing peas. Rapid soil tests have helped establish such practices. The importance of the fertility levels can also be illustrated by the fact that in 1943, returns per acre of asparagus contracted to Deerfield Packing Company varied from $95 to $504. It was found that a large part of this variation of a crop subject to rather similar climatic conditions was due to difference in the content of available soil nutrients .

It is realized that weather, to a certain extent, influences the level at which maximum crop returns can be expected. While optimum weather conditions may help yield a good

(Continued on page 26)

TABLE I

THE LEVEL OF VARIOUS SOIL FACTORS (a) ASSOCIATED WITH GOOD YIELDS OF SEVERAL VEGETABLE CROPS UNDER SOUTH JERSEY CONDITIONS

	Peas	Lima beans	Spinach	Tomatoes	Asparagus
pH	6.0–6.5	5.5–6.5	6.0–6.5	6.0–6.5	5.5–6.5
Organic Matter (b)	1.5–?	1.5–?	2.0–?	2.0–?	1.0–?
Nitrate Nitrogen (c)	25–100	10–100	50–150	25–100	25–100
Phosphorus	10–30	10–30	15–30	10–30	30–?
Potassium	100–200	100–200	100–200	100–200	300–?
Calcium (d)	1000–?	1000–?	1500–?	1000–?	1000–?
Magnesium (d)	100–?	100–?	200–?	50–?	100–?

(a) The amounts of nutrients are based on a one minute extraction of one part soil to two parts Morgan's Universal Extracting Solution. They are recorded in pounds per 2,000,000 pounds of air-dry soil or approximately one acre to a depth of 6⅔ inches.

(b) Per cent of air-dried soil on a weight basis. The upper limits have not been set.

(c) It has been difficult to establish optimum levels of nitrate nitrogen because of its variability in soil. Several samples taken over a period of about two weeks are necessary to determine whether supplies of this nutrient are sufficient.

(d) It is difficult to separate the effects of pH from that of calcium and magnesium. The upper limit has not been established. This may be almost without limit providing there is sufficient exchange capacity to hold basic nutrients.

TABLE II

PEA YIELD AT SEABROOK FARMS COMPARED WITH OTHER PEA-PRODUCING AREAS

Area	Five-year average	1940	1941	1942	1943	1944	1945
Seabrook Farms	2218	2293	2183	1460*	3114	2038	3362
Pennsylvania	1914	2450	2080	1470	1720	1850	....
Delaware	1112	900	950	1100	1230	1380	....
Maryland	1654	2000	1510	1200	1650	1910	....
Virginia	1304	2040	940	890	1590	1060	....
Wisconsin	1688	1750	1800	1760	1690	1440	....
Washington	2198	1610	2680	2300	2410	1990	....
Oregon	2636	1420	3440	3880	2600	1920	....
United States	1844	1854	1915	1953	1858	1640	....

*Rainfall for pea season least of any on record.

Indiana Fertilizer Conference

About one hundred industry and Purdue workers attended the Indiana fertilizer industry conference in the Memorial Union, Lafayette, on January 25th. Dr. N. J. Volk, head, department of agronomy and associate director of the Experiment Station, presided at the morning session and emphasized that farmers must apply more fertilizer per acre, use a grade to fit the crop's needs, and make use of more suitable equipment for applying fertilizer. Dr. A. J. Ohlrogge, reporting on the long time 4-year rotation experiment designed to show where fertilizer should be applied, stated that poorest results came from applying it to the legume crop, but best results were obtained by putting most of it on the cereal crop or by dividing it equally between crops. Heavy applications were more profitable than light, and extra nitrogen added to corn and wheat gave larger increases. Soybeans responded after the previous hay crop had been fertilized, and the more years the hay had been fertilized the greater the soybean response.

Professor O. W. Ford reported on available phosphoric acid and the deficiencies that may be due to storage of fertilizer samples. Dr. J. D. Hartman, department of horticulture, reported that on heavy fertilization of tomatoes plow-sole or broadcast methods of application were generally more effective than others. In general, about 1,500 pound of 3–12–12 fertilizer gave best yields. G. H. Kingsbury spoke on fertilizer supplies and urged use on more essential crops this year. He recommended more experimental work on minor elements and more studies on nutritive value of crops which are now under way at Purdue.

Dr. F. W. Quackenbush, state chemist, presided at an informal discussion of grades and methods of adding minor elements under the Indiana law. No changes in grades were recommended by the officials.

Sulphate of Ammonia Boosts Rice Production

Using sulphate of ammonia on his rice field increased the yield 20 bushels per acre for M. H. Hopson, Roe community, Monroe County, according to County Agent A. C. Smith.

The farmer applied the fertilizer in July at the rate of 200 lbs. per acre. The plot receiving the fertilizer produced 70 bushels per acre, and rice adjacent to it made 50 bushels per acre. Mr. Hopson made an increased return of $31 per acre after paying for the fertilizer.

Since this test was made on land in rundown condition, it shows yields can be partially maintained by use of commercial fertilizer, said the county agent.—*Arkansas Extension Service News Item.*

Fertilizing Timothy with Nitrogen for Seed Protection

In any timothy meadow in which there is a deficiency of nitrogen in the soil, a very large proportion of the stems or shoots are short and leafy, but with no heads. When the meadow is fertilized with nitrogen, a greater proportion of the shoots produce heads, the heads are longer, and the yield of seed is increased. The older a timothy stand, the less nitrogen there is likely to be in the soil unless this element is added as a fertilizer; hence, only low yields of seed may be expected.

In experiments carried out by the Department of Agronomy of the Ohio Agricultural Experiment Station, where nitrogen fertilizer was applied at different rates in three different seasons, the percentage increase was greater for seed than for hay. Unfertilized timothy yielded 1.3 tons of hay or 3 bushels of seed per acre. Where 48 pounds of nitrogen (the equivalent of about 235 pounds of sulphate of ammonia or cyanamid or 150 pounds of ammonium nitrate) were used per acre, a hay yield of 1.9 tons was obtained or 5.7 bushels of seed. This was an increase of 46 per cent for hay and 90 per cent for seed. Forty to 50 pounds of nitrogen per acre seem to be about an optimum annual rate of application. This would require from 200 to 250 pounds per acre of either sulphate of ammonia or cyanamid or 125 to 160 pounds of ammonium nitrate.

Treatments have been made experimentally on several different dates between November and the following May. All these dates have given satisfactory increases; however, if the application is made in the winter, care should be taken to avoid spreading it on land covered with a sheet of ice or it may be washed away before it has a chance to soak into the soil. If cyanamid is used, this should never be applied on dry or frozen ground or poor results will result. Since timothy heads begin to form in early April, best results may be expected when the fertilizer is applied on or before the middle of that month.

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Meeting the Demand for Fertilizers

Should any farmer not get all the fertilizer he wants in 1946, it will not be because the fertilizer industry does not have the capacity to produce all that is needed. Nothing would please the fertilizer manufacturer more than to provide every pound of fertilizer the farmer wants.

Certain disturbances that usually follow the cessation of war are making it difficult to get materials, replacements of broken machinery, and the labor required for capacity production. Strikes in vital industries are bound to have effect, in one way or another, on the producing capacity of other industries and on the public in general. Interruption or slowing down of production hinders the efforts of the innocent bystanders, so interdependent has become modern industry and the public in general.

The fertilizer industry is not in as great difficulty as some other industries in getting materials, equipment and supplies, and will, therefore, not fall as far short of meeting public demands—if it falls short at all—as other industries.

Uncertainties created by labor unrest do, however, create possibilities of disturbance in both production and demand, and are no index to what can be done under normal conditions.

Strikes and Agriculture

The promising outlook for agriculture in 1946 has been clouded by labor strikes in vital industries. Farm machinery, for instance, which had slowed down in the last quarter of 1945, is in worse position during the first quarter of 1946. The steel industry strike has curtailed production of basic materials needed for making farm machinery.

Strikes in the meat industry, of course, restricted the farmer's market for livestock, and strikes in the motor industry have prevented farmers from getting much needed trucks for hauling his products to market and his fertilizers and other necessities to the farm.

Furthermore, labor shortage on the farm has not been eased appreciably by release of men from the army. Going places and seeing the world has apparently weaned youth away from the farm. But strike-closed plants may discourage war veterans in their quest for jobs in industry and turn them farmward.

Decrease in industry payrolls is bound to

have repercussions on the farmer's market for his products. It will, therefore, not be surprising, in the face of uncertainties created by strikes, if the farmer decides to trim his sails and proceed cautiously with his farming program. This may result in lowering his crop goals, in lessening his livestock program, and in a general curtailment of his 1946 farming activities.

It has been said that farmers are becoming less independent and more interdependent. Industry and farming are certainly tightly bound together. Whatever upsets one upsets the other.

Unquestionably what the farmer wants is that such measures be taken as will enforce strike settlements and make it impossible for anyone to drop a bomb on his farming program.

Preliminary Report on 1945 Corn Fertilizer Tests in North Carolina

The extensive series of fertilizer experiments on corn in North Carolina during 1944, which were reported in the December 15, 1945, issue of THE AMERICAN FERTILIZER, were continued by the North Carolina Experiment Station and the State College of Agriculture during 1945. Approximately 600 extension demonstrations were conducted by county agents during that year. By the beginning of the present year, the results of the first 176 demonstrations reported had been tabulated by Dr. E. R. Collins in a preliminary bulletin to county agents.

On the check or "farmer's" acre the fertilizer used was equivalent to 375 lb. of 6–8–6 and 185 lb. of nitrate of soda, which supplied 52 lb. of nitrogen, 32 lb. of phosphoric acid, and 22 lb. of potash. This is much higher than the average use of fertilizer on corn and may account for the fact that land selected to produce 30 bushels per acre averaged 47.3 bushels.

On the test acre, the fertilizer application was increased to 80 lb. of nitrogen, 38 lb. of phosphoric acid, and 30 lb. of potash, equivalent to 475 lb. of 6–8–6 and 325 lb. of nitrate of soda.

The test acre produced an average (for 176 demonstrations) of 66.5 bushels, an increase of 19.2 bushels. The cost of the additional fertilizer was $6.10 which gives a cost of less than 32 cents per bushel for the increased crop produced by this extra fertilizer.

A complete report on the 1945 corn tests will be issued a little later in the year.

Totman-Summers Interest Buys Griffith & Boyd Fertilizer Co.

J. E. Totman, president of Summers Fertilizer Company of Baltimore, announces the purchase by Summers of the outstanding stock of the Griffith & Boyd Company as of January 28, 1946. Founded in 1887 by J. Edward Griffith and C. H. Boyd, Griffith & Boyd have continuously manufactured in Baltimore commercial fertilizers for distribution in the Middle Atlantic States. Their plant, located at Locust Point, Baltimore, Maryland, has a rated annual capacity of 50,000 tons of mixed fertilizer.

As conditions permit the plant will be sufficiently enlarged and modernized to manufacture the combined requirements of Summers and Griffith & Boyd. Griffith & Boyd will continue as a separate unit under the same management as heretofore: George A. Bratt, Sr., president; J. E. Griffith, Jr., vice-president; and George A. Biddison, secretary-treasurer. N. K. Totman has been elected a vice-president and director. Other Summers directors added to Griffith & Boyd's Board are J. E. Totman, J. H. Skeen and W. A. Fessler.

In addition, the Totman-Summers interest also operates fertilizer manufacturing and chemical plants in Maine and Canada.

Michigan Potato King Uses Ample Fertilizer

With a yield of 614 bushels of certified seed potatoes per acre on his 45 acre plot, J. D. Robinson of Pellston, Michigan, was awarded the title of premier potato grower at the annual meeting of the Michigan Crop Improvement Association. It was his fifth such award during the past ten years.

Included in his careful program of careful seedbed preparation was an application of 1,500 pound per acre of a 3–12–12 fertilizer. A sprinkler type irrigation carried the crop through dry spells, about six inches of water being applied during the growing season.

Cotton Council Elects Officers

At the recent meeting of the National Cotton Council held at Memphis, Tennessee, Oscar Johnson, the world's largest cotton producer, was re-elected to the presidency of the organization. H. L. Wingate, president of the Georgia Farm Bureau, was elected a vice-president.

Fertilizing Irrigated Pastures in the Western States*

The fertilizer requirements of irrigated soils vary greatly not only within each of the five climatic areas of the West but even between fields on the same farm. Like other farm lands, pastures must be fertilized if they are to produce the highest yields. While a field is in use as a pasture, plant nutrients are constantly drained away from it in the form of milk, meat, and other animal products. Some nutrients are returned to the soil in manure and through decay of plant material, and if inoculated legumes are present the nitrogen content of the soil is amplified by fixation of nitrogen from the air; these contributions, however, do not counterbalance the drain. Also, of course, n many cases a pasture soil is poor in nutrients as a result of previous cropping or is naturally deficient in some nutrients. By correcting soil deficiencies, fertilizing can increase yields, provide earlier spring grazing, improve forage quality, and aid in weed control.

In fertilizer studies at the Utah Agricultural Experiment Station, the following increases in yields of forage from mixed grass-legume pasture were obtained through fertilizing: Ammonium sulphate at the rate of 200 lbs. per acre, 21.5 per cent; treble superphosphate at 200 lbs. per acre, 37.5 per cent; treble superphosphate and ammonium sulphate each at 100 lbs. per acre, 45.2 per cent; manure at 20 tons per acre, 24.6 per cent; and manure at 10 tons per acre plus treble superphosphate at 200 lbs. per acre, 34.3 per cent.

The mineral fertilizers most generally needed are nitrogen and phosphorus. Potassium and sulphur are beneficial on some areas.

*From Farmers Bulletin No. 1973, U. S. Department of Agriculture.

Phosphorus

For pasture mixtures containing legumes, most irrigated soils become more productive if fertilized with phosphorus. Soils low in organic matter, or soil on which legumes, sugar beets, and other crops that are heavy feeders on phosphorus have been grown, almost always respond markedly to applications of phosphates. At the Utah Experiment Station an application of 200 lbs. of treble superphosphate increased forage yields 37.5 per cent, and at the Oregon Experiment Station an annual application of 300 lbs. of superphosphate per acre increased the forage yields of a mixed grass-Ladino clover pasture approximately 50 per cent.

Critical deficiencies in available phosphates are evidenced by slow growth of legumes. Even where legume growth appears satisfactory, applying phosphates frequently results in increased yields. Phosphates applied to pasture soils deficient in phosphorus encourage the growth of legumes in relation to that of grasses, and help maintain the desired proportion of legumes in the mixture. At the Utah Experiment Station, legumes composed 34 per cent of the stand on pastures fertilized with treble superphosphate as compared with 19 per cent where only nitrogen was applied.

Forage grown on soils that are deficient in available phosphorus does not contain enough phosphorus to meet the needs of livestock. This deficiency can be corrected by applying phosphates.

Desirable rates of application of phosphates per acre per year range from 100 to 300 lbs. of treble superphosphate or its equivalent. Phosphates may be applied to pastures at any season of the year. Fall or early spring application is usually desirable to bring about maximum production early in the grazing season.

(Continued on page 24)

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

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FERTILIZER MATERIALS MARKET

NEW YORK

Strikes and Other Shortages of Material Threaten Output Figures for Coming Season. Large Export Demand Evident but Shipments Mostly in Government Channels. Sulphate of Ammonia Shortage Becoming More Serious.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, February 2, 1946.

In spite of the present unfavorable outlook with regard to the fertilizer materials supply situation, agricultural economists in government and private industry feel that enough plant food will be made available this year to maintain crop production at a level with 1945. In view of the present steel strike, and its consequent affect on the deliveries of ammonium sulphate at a crucial time, it is believed by some that there will be a shortage of complete fertilizers during the new season. It is, however, too soon to determine to what extent the industry is to be handicapped in this direction.

Export inquiries are particularly active at this time, but very few shipments of fertilizer materials or mixed goods are being made outside of government channels to foreign countries. Because of the urgent world-wide requirements for plant food, this export demand will undoubtedly be strong and will remain unfilled until foreign fertilizer material operations are resumed.

Sulphate of Ammonia

It is estimated that the supply of this material has been reduced by approximately 70 per cent as a result of the steel strikes, and fertilizer manufacturers have only received around 50 per cent of their requirements. All producers are far behind in their shipments, and the situation has become critical. There are not at this time enough stocks of other inorganic nitrogen to relieve the ammonium sulphate shortage.

Nitrate of Soda

There is increased buying interest as the active consuming season draws near. Producers and importers of this material will continue to make allocations of supplies throughout the year in order that an equitable basis of distribution may be maintained. The production of domestic nitrate of soda is being affected by the present shortage of soda ash.

Organic Materials

If possible, the supply situation has become even more tight, and the recent strike of packing house workers has caused further shortages. There are no domestic offerings for the fertilizer trade, and the small supplies that do become available are going to the feed industry at ceiling prices. The prospects of renewed importation of tankage, blood and bone meal and other related materials from South America are not optimistic. Other countries are taking these supplies at prices well above our ceilings. There have been a few offerings in the market from Europe on such materials as bone meal, wool-waste, etc., but offerings have been at figures more than double the prices importers are permitted to pay.

Superphosphate

The supply of ordinary superphosphate continues to be able to take care of current demand, but there is very little of this material available for resale or export. It is felt that the present high rate of production will be maintained and adequate supplies will be available throughout the fertilizer year. The demand for triple superphosphate continues to exceed supply by a wide margin, and the supply situation in this market can hardly be improved upon before another fertilizer year.

Phosphate Rock

In spite of labor and other difficulties, producers are apparently being able to supply the needs of domestic acidulators. In addition to the heavy demand, there is constantly increased pressure for supplies abroad, as foreign sources are not expected to be able

to enter the market to any appreciable extent for at least two more years.

Potash

Deliveries of potash are slightly behind schedule due to transportation difficulties, but the heavy demand from mixers has been met adequately in most cases. Here also, the export demand is heavy and no possibility of satisfying foreign requirements. There will probably be no Russian or Palestine potash salts received in this country for some months to come.

CHARLESTON

Fertilizer Shipments Behind Last Year's Figures. Sulphate of Ammonia and Organics in Extremely Short Supply.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, February 1, 1946.

Organics.—The shortage on these materials has developed to the point where nothing is being offered and in a number of cases, the fertilizer manufacturers have had to change their formulas, reducing the organic content.

Sulphate of Ammonia.—With the steel mills now operating at slightly under 6% of capacity, fertilizer manufacturers are faced with a very serious situation.

Nitrogen Solutions.—These are now becoming difficult to obtain and unless the situation changes on these and sulphate of ammonium, production of mixed fertilizers this season will be reduced.

Phosphate Rock.—No change has occurred in this material and producers continue closely sold up for the first six months of 1946.

The movement of mixed goods has begun to pick up. Shipments so far this season continue behind last year.

CHICAGO

Supplies of Fertilizer Organics Extremely Scarce with No Improvement in Sight. Feed Market Tight.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, February 1, 1946.

Scarcity of offerings continued to limit trading in the organic market, while demand remains very strong at ceiling prices. Several producing plants are shut down, owing to the fact that shortage of labor and of raw material continues critical.

In feed markets, demand and supply remain far apart, with no indication of any nearby improvement.

Ceiling prices are:

High grade ground fertilizer tankage, $3.85

CASE HISTORY No. 2

in a series of factual experiences of a group of American manufacturers with Multiwall Paper Bags.

COST COMPARISON

	Open-Mouth Burlap Bags	Multiwall Paper Valve Bags
Bag Cost per M	$142.00	$76.00
Bag Cost per 100 lbs.	.142	.076
Labor Cost per 100 lbs.	$_____ (eight men packed 500 100-lb. bags per hr.)	$_____ (five men now pack 600 100-lb. bags per hr.)
Total Bag and Labor Cost per 100 lbs.	$_____	$_____
Saving per Bag, Paper over Burlap		$_____
Saving per Ton, Paper over Burlap		$_____

NOTE to fertilizer manufacturers: We suggest that you fill in the blanks from your own cost figures and compute savings with multiwall paper valve bags.

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Custom-built multiwalls protect products from damaging dampness.

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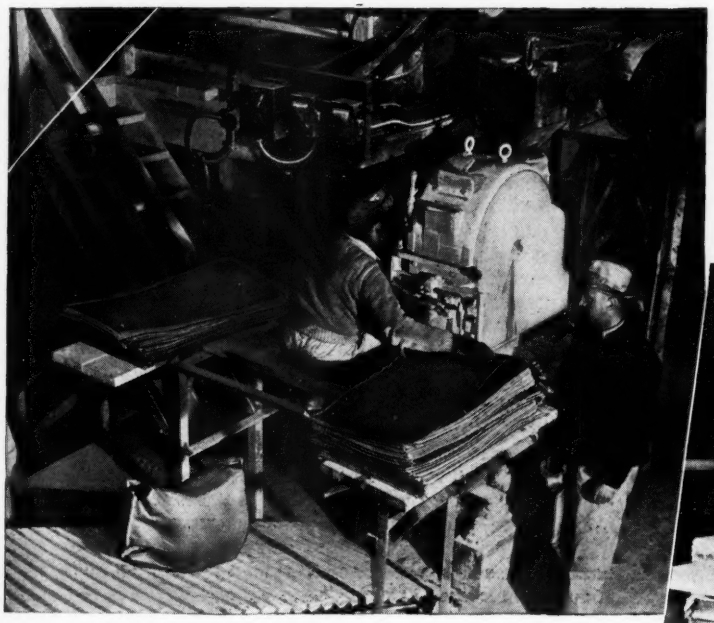

(At left) This high-speed St. Regis Packer fills Multiwall Paper Valve Bags and weighs them simultaneously.

(Below) Illustrating the quick, easy handling of Multiwall Paper Bags.

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Without obligation, please send me full details regarding the "Case History" outlined above.

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COMPANY_____

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to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.53 ($6.72 per unit N); dry rendered tankage, $1.25 per unit of protein, f. o. b. producing points.

Care of Soil Fertility a Postwar Need

Postwar years must bring increased conservation of soil productivity on the individual farms of the nation, according to the annual report of N. E. Dodd, director of the Field Service Branch, transmitted to the U. S. Secretary of Agriculture. The report covers activities of the former Agricultural Adjustment Agency for the year ended June 30, 1945, and includes mention of activities continuing since AAA was incorporated under the Production and Marketing Administration as the Field Service Branch.

Millions of acres were overcropped and overgrazed to get the farm production which hastened victory, Mr. Dodd points out.

"Technical improvements in farming and unusually favorable weather during the war have covered up the actual effects of these severe drains on our soil. New and improved varieties of seed, together with increased use of lime and fertilizers, practices to conserve moisture, and other beneficial measures during the previous decade, helped to bring about big increases in crop yields.

"But the increased yields themselves, while important to meet emergency demands, have taken a heavy toll of plant-food elements from the land. This is serious, for the minerals contained in crop and livestock products come from nutrients in the soil.

"Our full development, therefore, depends largely upon the food we eat, the quality of which is influenced by the kind of soil which grows it. . . . Unless we conserve the productivity of our farms, we will jeopardize our future strength and prosperity."

Mr. Dodd recommended that postwar farm plans include: Returning farming to a balanced rotation system, protecting land against erosion, and restoring plant food to the depleted soil; increasing domestic consumption; preparing a program for larger exports to war-ravaged countries; production of agricultural commodities guided by consumer demand and foreign markets; and such aids to farm security as measures to assure fair prices and a stabilized farm income.

Farmers on nearly 3.5 million farms cooperated in the 1944 AAA program. Through such cooperation, improved farming methods are being encouraged on farms which embrace nearly 75 per cent of the nation's cropland. Preliminary estimates are that the volume of practices performed in 1945 will be larger than in 1944.

To replace soil minerals and prevent erosion, almost 24 million tons of ground limestone and nearly 2 million tons of superphosphate were applied in 1944. As an erosion-prevention measure, organic matter was returned to the soil in 1944 by using as protective cover or turning under nearly 23 million acres of green-manure and cover crops. Summer fallow was protected on more than 12 million acres. In building earthen dams and reservoirs, over 127 million cubic yards of earth were moved.

Acreage of grass and legume seeds harvested under the special production program was almost doubled in 1944. The flaxseed program—another production program—was an important factor in increasing indicated flaxseed production in 1945 by over 50 per cent more than in 1944.

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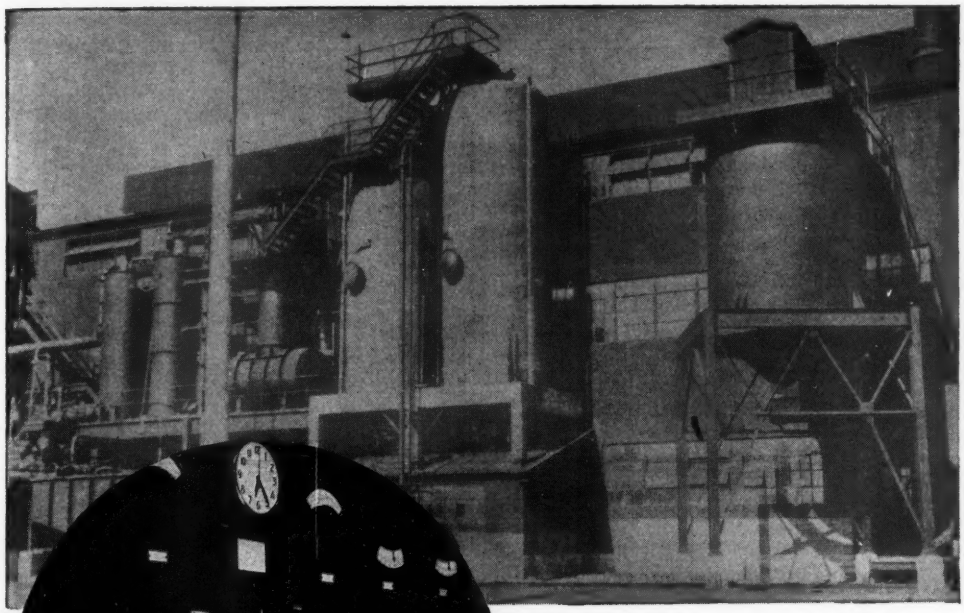

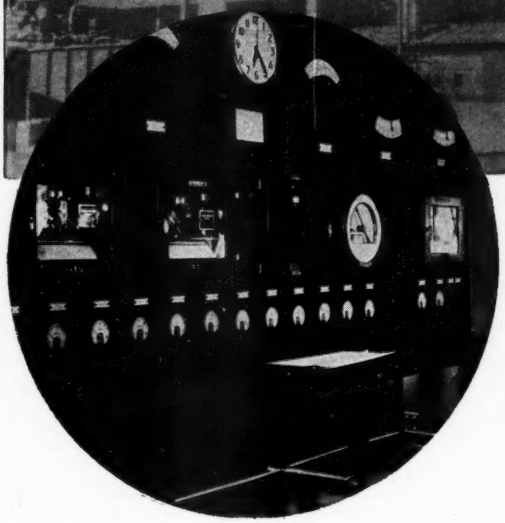

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Sweet Potato Fertilizer Studies in East Texas

Extensive sweet potato fertilizer tests have been under way at Gilmer, Texas, since 1938. Due to the variability of the soil, the results have not been entirely satisfactory. For this reason a program embracing tests in Cass, Smith, Van Zandt, and Harrison counties, approximately surrounding Upshur county, was started during the 1945 season. The same field layout, containing twelve treatments, replicated eight times in four-row plots, was used in each outfield test as well as at the laboratory. Texas Porto Rico plants for these tests were supplied by the laboratory, to eliminate variation in yield due to strains.

Although the yields varied widely between locations, several treatments were uniformly good and others were poor at all locations. The following table, giving the average yield for the four locations, indicates that 900 lb. of 4–8–10 is the best fertilizer treatment for the East Texas area, followed closely by 900 lb. of 6–10–7, and 900 lb. of 3–9–18. In every test, the yield of U. S. No. 1 and No. 2 grades was about 75 per cent of the total yield.

AVERAGE YIELD FOR FOUR COUNTIES, 1945 IN BUSHELS PER ACRE

Fertilizer treatment	Lb.	Total Yield
None		51.2
4–12–8	300	90.4
4–12–8	600	132.1
4–12–8	900	125.1
4–12–4	600	99.0
4–8–4	900	123.3
4–8–6	900	130.6
4–8–8	900	118.2
4–8–10	900	151.4
6–8–6	900	128.9
6–10–7	900	143.1
3–9–18	900	139.4

Idaho Agronomist Recommends Nitrogen for Winter Wheat

K. H. Klages, University of Idaho agronomist, recently revealed data showing that ammonium sulphate fertilizer on plot experiments of winter wheat has shown yield increases of from five to nine bushels to the acre on several plots of ground. Heaviest increases came on acreages where stubble of the previous year's crop had been turned under before application of the fertilizer was made.

"Ammonium sulphate enables the soil—through increased nitrogen supplies—to make use of the old straw," Klages explained. "Without it the fertilizing qualities of the rotted stubble cannot be used by the new plant, and the yield is actually lower than where the stubble is destroyed the in fall.

"There should be 150 pounds to the acre applied in regions such as Moscow where we have abundant rainfall. In the very dry areas, the amount can be cut to a minimum of 50 pounds to the acre. At that rate any farmer will more than get his money back with the first year's crop, and that is not the end of the fertilizer. It goes on paying for several seasons."

Klages reminded farmers and wheat-growers of the state that the best protection against erosion is the ability of the soil to produce enough plant material to prevent washing in steep areas. This alone would pay the cost of the fertilizer over a period of years, he reasoned.

F. W. Ayers, until recently on the sales-service force of the Bemis Bro. Bag Co. at Peoria, Ill., has been transferred to the Bemis plant at San Francisco, where he will carry on sales promotion work on multiwall paper bags.

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FERTILIZING IRRIGATED PASTURES

(Continued from page 16)

Nitrogen

Grasses are heavy feeders on nitrogen, and the most satisfactory grass yields are obtained only when an ample supply of nitrogen is readily available in the soil. If legumes in the pasture mixture are properly inoculated, nitrogen for their growth and also for growth of the grasses becomes available through fixation from the air. Even so, grasses usually respond favorably to nitrogen fertilizers, in both volume production and protein content.

Sources of nitrogen include farm manures and commercial nitrogen carriers such as ammonium sulphate, sodium nitrate, and ammonium nitrate. A ton of barnyard manure contains on an average about 10 lbs. of nitrogen. Ammonium sulphate, sodium nitrate, and ammonium nitrate contain about 20 per cent, 16 per cent, and 35 per cent nitrogen, respectively. Rates of application of these materials should be based on their nitrogen content.

Where legumes tend to retard the growth of grasses or crowd them out, application of nitrogen increases the vigor and volume growth of the grasses and contributes to maintenance of the desired pasture stand composition. Under these conditions, it is profitable to apply 75 to 100 lbs. per acre of ammonium sulphate, or an equivalent, to mixed grass and legume pastures in early spring. For pure grass pastures, commercial nitrogen fertilizers are especially helpful in obtaining maximum yields. Grasses in pure stands require heavier applications of nitrogen than stands containing inoculated legumes.

Nitrogen should be applied in early spring, or at whatever time rapid growth is most desired.

Potassium and Sulphur

Potash is usually available in sufficient quantities for pasture purposes in the soils of the West. In some cases, however, especially on fields that have been producing row crops under irrigation for many years, application of muriate of potash or its equivalent at a rate of 50 to 100 lbs. per acre may be beneficial to Ladino clover or other legumes in the mixture. Applications of potash in addition to nitrogen and phosphorus give beneficial results on some soils in western Washington, Oregon, and California, and to a limited extent elsewhere. Peat and muck pasture soils usually respond to application of potash. Where potash is deficient, fertilizers may be purchased as single ingredients or as a 3–12–4, 4–16–4, or similar mixture.

Legumes respond to applications of sulphur on many soils in northern Idaho, western Oregon and Washington, and California. Sulphur may be applied as gypsum or as elemental sulphur. Gypsum is the preferred form for use on acid soils, as it does not increase soil acidity. Sulphur is usually applied at a rate of 75 to 100 lbs. per acre of gypsum, or the equivalent, before seeding and each year thereafter during the life of the pasture stand.

Lime

In most irrigated areas of the West the soils are highly calcareous and application of lime is not needed. Acid soils occur only in the high-rainfall areas along the Pacific coast. Here Ladino clover, which tolerates a considerable degree of soil acidity if phosphate needs are adequately met, is the legume commonly used in irrigated pastures, and a desirable response to application of lime is not usually to be expected from any but extremely acid soils.

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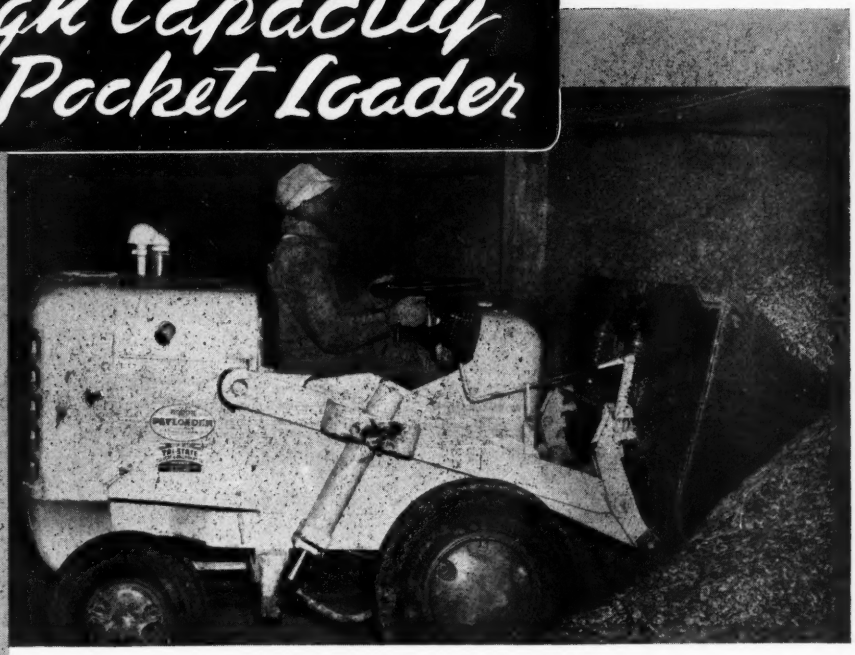

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RAPID SOIL TESTS

(Continued from page 11)

crop with a soil content appreciably lower than lowest level indicated, it is believed that these limits are suitable under average conditions. In other words, spinach may yield a good crop in some years with only 10 lbs. of soluble phosphorus per acre. However, if more than 15 lbs. are present, there is much better likelihood for it to occur.

Determining Liming Needs

The measurement of pH, while giving the intensity of acidity or alkalinity, does not determine the amount or kind of lime needed for a particular soil. The amount of lime needed can be calculated indirectly from pH if the soil's characteristics are known or from lime requirement tests.

The kind of lime necessary can be determined by calcium and magnesium tests run at the same time with pH. For example, rapid tests have shown that about 10 per cent of the acreage of Seabrook Farms has optimum pH values but insufficient calcium for maximum crop production. Such soils have low exchange capacity and small applications of limestone have made appreciable changes in pH. An examination of only the pH of these soils is insufficient since the pH value may be about 7.0 and yet there is insufficient calcium for good yields. Further additions of ordinary limestone in amounts to supply sufficient calcium raise the pH value to a point which is incompatible with good growth.*

In several cases, where dolomitic limestone has not been used, crop failures have been traced by rapid soil tests to a deficiency of magnesium. In the latter case, use of dolomitic limestone soon corrected the situation.

"Trouble Shooting"

As has been pointed out, we have attempted to use rapid soil tests as a means of prevention rather than cure. Prior to the establishment of the Research Division, soil tests were used only for "trouble shooting" after unsatisfactory crop yields. We now make the analysis before the crop is grown and from our measures of requirements we find necessary for good crops, we can determine what applications should be made of fertilizer, lime, and organic matter. In other words, rapid soil tests have replaced the practice of growing a crop and if not satisfactory, investigating the reasons after failure had occurred. As a result of this system, rapid soil tests are being called upon to a lesser extent for the purpose of "trouble shooting." Some still has to be done, but it is hoped that eventually we may have sufficient foreknowledge to practically eliminate the need for it.

In the past, results from this laboratory have traced poor crop yields to be due to lack of sufficient organic matter, calcium, magnesium, major fertilizer nutrients (on private farms), to improper pH, to excess sodium and

*An experiment is now being conducted to determine a satisfactory method of adding extra calcium to such soils. Calcium from neutral carriers such as gypsum looks promising There is also the possibility of using large quantities of a very coarse limestone. In the latter case, the solution of the limestone is not rapid enough to raise the over-all pH too high. However, roots in conact with a large particle may absorb sufficient calcium for their needs.

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See Page 4

fertilizer. The rapid tests have not been very valuable in diagnosing trace element deficiencies. However, by eliminating many other possible causes of crop failure, they have turned the direction of investigation to this and other channels. It may be pointed out here that "trouble shooting" can be practiced successfully only after much information relative to the soil and plant has already been gathered.

Conclusions

On the basis of results obtained by the G. L. F.-Seabrook Farms Raw Products Research Division, rapid soil tests for this area are considered to be definitely worth while. Rapid soil tests have been but one of the tools used to gather information concerning vegetable crop production. The value of this particular tool has grown as our knowledge concerning the tests and the manner in which they can be put to use has increased. They have been used primarily as a means of preventing nutritional ailments rather than curing them.

This laboratory has analyzed about 10,000 samples of soil, representing approximately 25,000 acres of South Jersey fields. Careful studies as to methods of sampling, determination, and interpretation of results have made possible the practical use of rapid soil testing. Specifically these tests have:

1. Provided a measure for the amount of lime and organic matter essential for growing good vegetable crops.
2. Furnished information to correct conditions in trouble fields due to calcium, low organic matter, or some other factor.
3. Furnished a measure for the determination of the amounts of soil nutrients most desirable for growing lima beans, peas, spinach, tomatoes, and asparagus in this particular area.
4. Furnished a guide for applying lime, fertilizer, and cover crop practices.
5. Confirmed the results from fertilizers used and indicated necessary changes of the formulae.
6. Provided a more accurate measure of lime practice by showing the amounts of calcium and magnesium in the soil as well as the level of pH.
7. In general, checked on prevailing farm practices and in certain cases suggested new ones. For the latter, the rapid soil tests have not only served as an initiator of research but have been used as a means of determining the adequacy of new measures suggested.

LIGNIN: FERTILIZER MATERIAL OR SOIL AMENDMENT?

(Continued from page 9)

"Plants in soil receiving L. E. F. showed considerable indications of nitrogen starvation during early periods. No improvement in soil structure with L. E. F. treatments was noted with less than ten tons per acre. Even with this large amount, improvement in structure was nowhere near as good as with the 2½ tons of lignin per acre.

"Results of dry weight of shelled bean seeds for various treatments are given in Table II."

TABLE II

INFLUENCE OF WOOD WASTE PRODUCTS UPON YIELDS OF LIMA BEANS

TREATMENT	DRY WEIGHT OF SHELLED BEANS*
Check	9.8
2½ tons lignin per acre	14.4
5 tons lignin per acre	15.9
10 tons lignin per acre	12.7
2½ tons L. E. F. per acre	11.0
5 tons L. E. F. per acre	9.9
10 tons L. E. F per acre	8.2

*Grams per pot—average of four pots

"Lignin used in these experiments is a calcium lignin sulphonate with a pH of approximately 10.5. Its use in large quantities in the soil markedly raised the pH of the soil and so it could be used as a liming material. However, the relatively poorer yields of the 10 ton application may be due to the fact that pH was raised to above 8 in the first four weeks after applying lignin."

At the Orono, Maine, Conference on Wood Products, held in June, 1945, several reports were read which dealt with the use of wood

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products as soil amendments. Among these, the following will be noticed:

"The Use of Lignin in Potato Fertilizer" was presented by Stuart Dunn of the New Hampshire Experiment Station (*4*). The investigation tested the influence of hydrolyzed lignin from the Scholler process with and without sulphur on the growth of potatoes and on the quality of the starch. The work has not progressed far enough for definite conclusions. The lignin treatment seems to show good possibilities. The yield data indicate that lignin alone produced the largest weight of tubers, with lignin plus sulphur second, and fertilizer alone the lowest weight. The starch content of the tubers from the lignin-treated plants was higher than from the other treatments. A brief tabulation of the results is given in Table III."

TABLE III
SUMMARY OF RESULTS
(Plants 98 days old)

	AVERAGE WT. GRAMS	STARCH CON'T. PER CENT
Lignin alone.....	451.2	19.68
Lignin plus sulphur...	411.2	11.77
Control.....	319.2	10.24

The moisture content of the tubers from each series was determined. For the lignin alone, the moisture content was 41%, lignin plus sulphur, 55%, and for the control, 58%. The authors gave it as their opinion that the primary effect of the Scholler lignin was on the physical properties of the soil.

In the next series of tests it is planned to include peat as one of the organic materials.

General Summary

The problem of lignin is not new. Vast amounts of lignin are being produced every day in the forests and on farms. Whether lignin is an asset or a liability future research alone can tell. For a new chemical industry to develop from lignin it will have to be proved that the proposed operations are cheaper and better economically than the materials it is planned to displace. It is very desirable in the interests of national conservation that the fullest utilization be made of the vast quantities of lignin materials which are annually wasted, for wherever possible it is best to use materials which are constantly being replenished by nature than those which are the result of long geologic processes. Agriculture is a consumer of low-cost bulk materials. Sulphite waste liquor has fertilizer elements such as calcium, magnesium, organic matter, sulphur, and potash. Waste residues from the Scholler process have humus-forming possibilities. New processes such as the ammonium bisulphite process are yielding a waste liquor which should attract more interest for use as a fertilizer. Sulphite liquor has also shown possibilities as the basis of an insecticide where the active agent might be a fluoride, an arsenate, or copper oxychloride, or boron. The field is large and challenging. The answers will be found. Our dwindling natural resources, emphasized strikingly during the recent War, make it imperative that the answers be found. The lumber and pulp and paper industries are not alone interested in finding the answers: all industries and the nation as a whole are also involved, since the utilization of the vast quantities of wood waste would have a very direct bearing on the national economy.

Literature Cited

(*1*) J. Seiberlich, "Fundamentals of Lignin Chemistry." *Wood Products Bulletin*, No. 7, Oct., 1945.
(*2*) Eduard Farber, *The Chemurgic Digest*. Vol. IV, No. 6, Mar., 1945.
(*3*) Max Phillips and Associates, *Jour. Agr. Res.* Vol. 53, pp. 209–224, 1936.
(*4*) Stuart Dunn and Associates, *Wood Products Bulletin*, No. 7, Oct., 1945.

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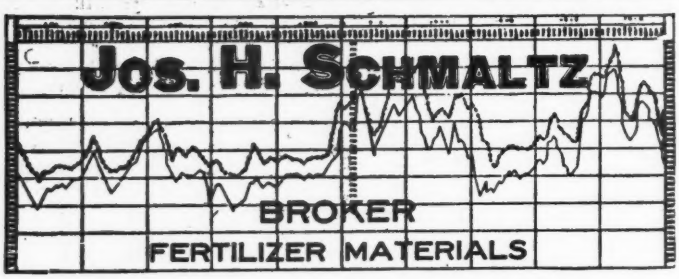

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